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SALMON AND SEA TROUT OF THE RIVER INNY.

BY ARTHUR E. J. WENT.

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No. 29.

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(Plate 18.)

(Read November 25, 1947. Published Seperately, September 6, 1948).

The River Inny in County Kerry is a small spate river, about 16 miles long, with a catchment area of only 47 square miles (see Fig. 1). Its catchment area is entirely on the Old Red Sandstone, and it drains some very high ground (over 2,000 feet). As limestone is absent from the catchment area the waters of the river are always acid, the extent of the acidity depending to some degree on the height of the water. An analysis of the waters of the river when it was at an average level is given in Table 1. (See Appendix for all tables.)

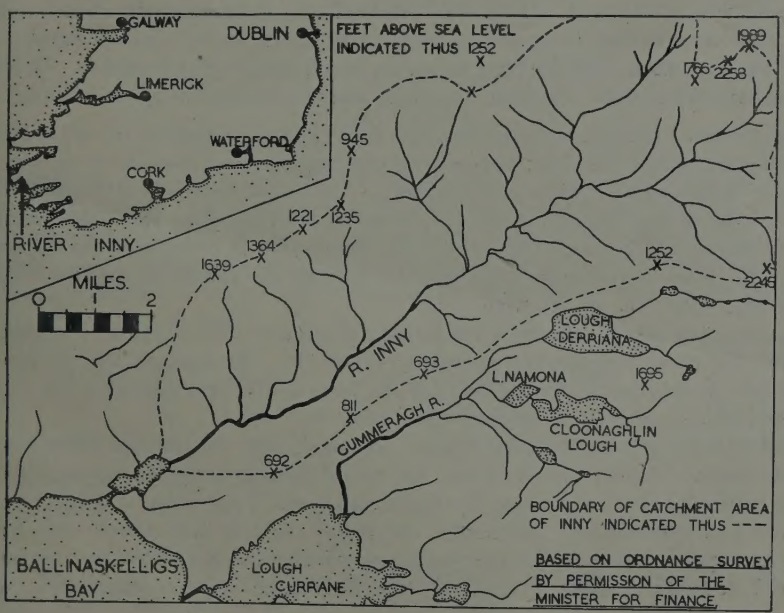

Fig. 1. Sketch map of the Inny watershed.

Apart from affording sport to the angler the Inny supported a commercial net fishery, partly in fresh water and partly in the tideway. Netting in the freshwater portion of the river has, however, been abolished under the provisions of Section 35 of the Fisheries Act, 1939, as from 1st January, 1948. The material on which this investigation was based was collected in the years 1941, 1942, 1943 and 1944 by the owner of one of the nets fishing in the river, and consisted of 747 satisfactory sets of scales and data relating to salmon, and 217 sets relating to sea trout. Unfortunately it was not found possible to weigh the fish. The distribution of the samples over the various months of the season is indicated in Table 2.

Age and Growth of the Salmon.

Smolt ages. The distribution of the various smolt classes has been given in Table 3. Four smolt classes were present. The proportion of the three-year smolt class was very high when compared with the results from other Irish rivers (see Went, 1947, *Sci. Proc. R. Dublin Soc.* 24 (N.S.) No. 19 p. 171). The proportion of old smolts (three and four years old) tends to decrease as the age groups are ascended. In other words there was a decrease in the average age of the smolt as the age groups were ascended.

Smolt types. When dealing with salmon of other Irish rivers (see bibliography, Went, 1947. *op. cit.*) it was mentioned that the smolts could be divided into two types, namely, (1) Type B. smolts which showed two or more growth elements on the scales corresponding to growth in fresh water in the spring prior to migration to the sea as a smolt, and (2) Type A. smolts which made no such growth. In the present material a similar division was made and the results are given in Table 4.

Age groups. The fish were divided into three groups of maiden or unspawned fish and one group of fish which had only one common character, namely the presence of one or more spawning marks on their scales. The results have been given in Table 5. The bulk of the fish were grilse (1 + winters) with the other three age groups each forming 7.0% or less of the total. The proportion of previous spawners was low (3.1%), being considerably lower than the average for Ireland in 1944 and 1945 (see Went, 1947, *op. cit.* p. 175).

May was the best month for small spring and summer fish (2 and 2 + winters) and July for grilse and previous spawners (Table 6). In April all the fish were spring fish, in May 39.1% were spring fish, in June 10.8%, and thereafter the runs consisted almost entirely of summer fish (Table 7).

Twenty-three previous spawners were examined, and they all exhibited the "short absence" habit, that is to say, the period feeding in the sea between successive entries into fresh water was less than a full year. Twenty-one of the previous spawners had spawned once previously, one twice, and one three times. The fish which had spawned three times previously, measured 35 inches in length, and was captured on 19 July, 1941. Fish of this type in Ireland are exceedingly rare. As

mentioned in a previous publication (Went, " The Value of the kelt " *Salmon and Trout Magazine* No. 119, Jan. 1947. p. 45) only two previous specimens have been recorded from Ireland. A photograph of one of the scales of this fish is given in Plate 18.

Divided migration and return. In Table 8 the years in which the different fish were hatched have been indicated. Five-year classes, i.e. the broods of five years, were responsible for the runs in one year, but over 96% of the fish belonged to two year-classes.

Size distribution. The distribution of the various size groups has been given in Table 9, and is illustrated in Fig. 2. As would have been expected in a grilse river the fish were concentrated in a few length groups, almost 3/4 of the fish having lengths between 21.95 and 26.95 inches.

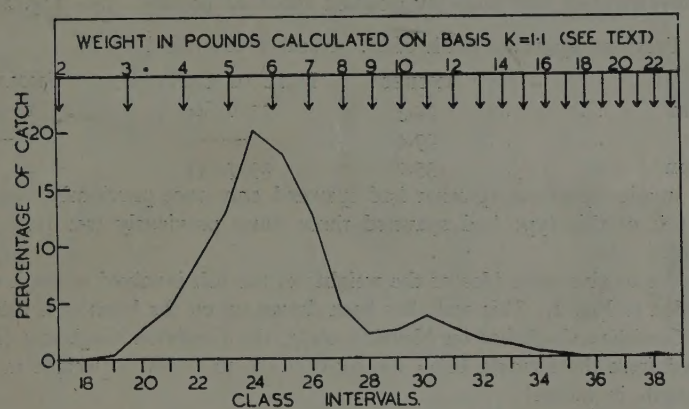
WEIGHT IN POUNDS CALCULATED ON BASIS K=1·1 (SEE TEXT)
2 3 4 5 6 7 8 9 10 12 14 16 18 20 22
PERCENTAGE OF CATCH
0 5 10 15 20
18 20 22 24 26 28 30 32 34 36 38
CLASS INTERVALS.

Fig. 2. Estimated size distribution of the Inny salmon.

Average sizes. Unfortunately the person collecting the material was not prepared to weigh the fish, and therefore we have had to be content with the length measurements only. Details of the average lengths in the different smolt classes of the different age groups are given in Tables 10–12, no attempt having been made to give the monthly averages, except in the case of the grilse, as the numbers of other age groups were small.

(a) Grilse (1 + winters). Number examined = 640.

	Inches	Date of Capture	Smolt Class
Minimum	18.6	3/7/'42	2 year
Average	24.5	——	——
Maximum	30.3	19/7/'41	2 year
	30.3	15/9/'41	2 year

From June onwards the average length of the grilse increased slightly as the season progressed.

(b) Small spring fish (2 winters). Number examined = 32.

	Inches	Date of Capture	Smolt Class
Minimum	26.4	11/5/'43	2 year
Average	32.4	——	——
Maximum	35.1	30/5/'41	2 year

(c) Small summer fish (2 + winters). Number examined = 52.

	Inches	Date of Capture	Smolt Class
Minimum	27.5	7/6/'41	2 year
Average	31.4	——	——
Maximum	38.0	15/9/'41	2 year

The largest fish of this age group was the largest fish of which scales were examined in this investigation and probably weighed about 22 pounds. (See Fig. 2.)

(d) Previous spawners (with SMs). Number examined = 23.

	Inches	Date of Capture	Smolt Class
Minimum	24.3	23/6/'44	1 year
Average	29.4	——	——
Maximum	35.0	19/7/'41	2 year

The smallest previous spawner had spawned only once previously, whereas the largest fish of this type had spawned three times previously (see page 336 and Plate 18).

In order to give some idea of the weights of the fish involved a rough scale has been added to Fig. 2. This scale has been drawn up on the basis of a value of 1.1 for the *Condition Coefficient* on Menzie's scale, the *Condition Coefficient* (K) being calculated from the formula $K = 100{,}000W/L^3 \times 36$. (W = weight in lbs. and L = length in inches).

Erosion. After a sojourn in fresh water the material of a scale of a salmon is partly absorbed, particularly at its margin. In the present material a proportion of the fish had eroded scales (see Table 13). In each age group the proportion of fish having eroded scales and the average degree of erosion increased as the season progressed. Erosion in the grilse (1 + winters) was not as advanced as in the other age groups.

Calculated lengths. The lengths of each maiden or unspawned fish at the end of every year of life were calculated in the usual way from the measurements of the scales, i.e. on the assumption that the growth of the scale is strictly in proportion to the growth of the fish.

River life. The relationships of the parr lengths are dealt with in this section. In Table 14 the growth in freshwater has been indicated for each smolt class (see also Fig. 3.). The fastest growing parr migrated first. At the end of the first year the one-year smolts were markedly longer than those of the other three smolt classes. Similar conditions have already been described for other Irish rivers (see bibliography Went, 1947, *op. cit.*). The length of the smolt was also calculated, and it

was shown that the mean smolt length increased as the smolt classes were ascended. (Table 14). The distribution curves for the two year smolt class have been added to Fig. 3.

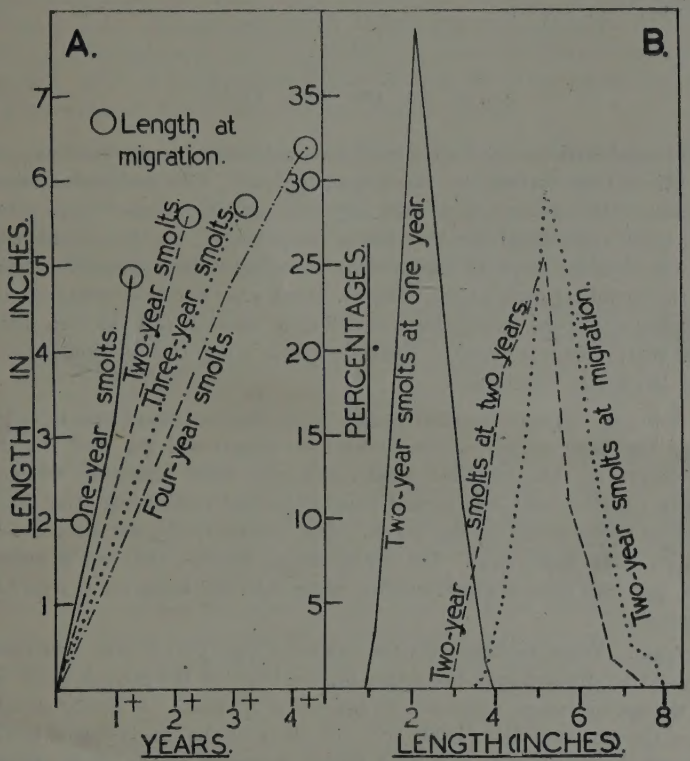

Fig. 3. A. Growth of Inny salmon in fresh water.
B. Distribution curves for the two-year smolts at one-year, at two years and at migrations as percentages of the total.

As was mentioned on page 336 the smolts could be divided into two types namely Type A and Type B smolts. The growth in each type in each smolt class is given in Table 15. In general the Type A smolts were longer at the end of any one year than the Type B smolts of the same year class.

In Table 12 the growth in fresh water of the different age groups has been given, and there appears to be no marked differentiation between the different age groups.

Sea life. The relationships of the lengths at the end of every year of sea life are dealt with in this section. In Tables 11 and 12 the lengths of the different age groups at the end of every year of sea life have been given. Taken as a whole the grilse had slightly superior lengths at the end of the first sea winter, but the differences are small and may not be significant. At the end of the second sea winter

the small spring fish (2 winters) were longer than the small summer fish, (2 + winters), so much so in fact that although on the average, the small summer fish put on 2.4 inches between the end of the winter and capture, they were still smaller than the small spring fish.

Notes on the Sea Trout.

As mentioned earlier a small amount of material relating to sea trout was collected from the River Inny during the years 1941 to 1944. This material, consisting of sets of scales with relevant data from 217 fish, cannot be regarded as completely adequate, quite apart from the question of its paucity. The fish, from which the material was obtained were all captured by means of a draft net with a mesh of 7 inches in the round ($1\frac{3}{4}$ inches knot to knot). Such a net is clearly selective, as many of the smaller sea trout, particularly whitling or finnock (fish in their first post-migration year) escape capture. Nevertheless bearing this in mind the results appear to be worth recording.

Smolt ages. In Table 16 the distribution of the different smolt ages in the various age groups has been given for the maiden or unspawned fish and the previous spawners together. The two-year smolts were the most important forming over three-quarters of the total, the second most important class being the three-year smolts (about one-seventh of the total). The proportion of one-year smolts was very high (cf. G.H. Nall, 1930. *The life of the sea trout* p. 311) but it must be remembered that this river is much further south than the majority of rivers investigated heretofore.

Smolt types. When dealing with the salmon (page 336) it was mentioned that the fish could be divided into two types on the basis of the growth made in fresh water in the spring before migration to the sea as a smolt. A similar division can be made in the sea trout also (Table 17). The bulk of the fish belonged to the type B smolts and the proportion of type A smolts increased as the smolt classes were ascended (Table 17).

Age groups. In Table 18 the fish have been classified on the basis of the period of sea feeding. It will be noted that fish in their second post migration year were in the majority. The relative absence of whitling or finnock (fish in their first post-migration year) to some extent, may have been due, as explained previously, to the selective capture of the fish. This is confirmed by consideration of the previous spawners from which it was estimated that about 20% had originally spawned in their first post-migration year (Table 18). Fish in their third or fourth post-migration year were clearly unimportant.

The monthly distribution into the various age groups of the fish investigated has been given in Table 19. In general the proportion of previous spawners tends to decrease as the season progresses. Although there was, in the material at the writer's disposal, an increase in the proportion of previous spawners in July, the

large incoming populations of small maiden fish, not sampled, tend to provide runs of fish almost completely maiden in character, as we know from our observations on this river.

In the material at the writer's disposal 70.5% of the fish were maiden fish, and the remainder were previous spawners. Of the previous spawners, 64 in number, 38 (59%) had one spawning mark, 20 (31%) had two such marks and 6 (10%) had three marks. There is a suggestion (Table 16) that the older smolts tend to return to the fresh water earlier than the younger smolt groups.

Dates of the incoming populations. In Ireland it is generally assumed that there are no worth-while runs of sea-trout in most of our rivers until the end of June. Whilst this may be so in some rivers, it is obvious that in the Inny there are clean-sea-trout entering the river from the beginning of April onwards. In fact the peak of the runs of large fish would appear to be in May (Table 19).

Divided migration and return. The years in which the fish were hatched have been indicated in Table 20. In the material at the writer's disposal the fish were derived from five spawning years. Owing to the absence of the younger smolt classes in the whitling (fish in their first post-migration year) the progeny of one other spawning may have been eliminated.

Average sizes. The average sizes in the various categories of fish have been given in Table 21. The symbols used in the first column of this Table require some explanation. The first figure indicates the period of feeding in fresh water before the smolt migration, the figure or symbol after the full stop indicates the period of sea feeding (+ = fish in their first post-migration year, 1 + in their second post-migration year, etc.) and the symbols SM+ which follow indicate the number of times a fish has spawned and returned to the fresh water after a period of sea feeding. After spawning the growth rate, as might have been expected, tended to fall off very much. This is partly due to the necessity of recovering material lost at spawning, and partly due to the fact that between spawnings the period of feeding in any one year is limited to two or three months. For example, as will be seen later, between the end of the first sea winter and the date of capture, the 2.1 + category increases in length from 12.6 inches to 16.4 inches (3.8 inches) whereas between the first spawning and the second return to fresh water as a clean sea trout the increment was only 1.2 inches (from 16.4 to 17.6 inches).

In the whitling (fish in their first post-migration year) the smolt age would appear to have a considerable influence on the size of the fish. For that reason only the whitling derived from old smolts appear to be taken by the draft net used in the River Inny. In those fish which have spent longer feeding in the sea before returning to fresh water to spawn, the smolt age has a much smaller effect on the mean length of the fish (cf. 2.1+ and 3.1+ fish in which the mean lengths are 16.4 and 16.5 inches respectively. Taking all the smolt classes together the mean lengths are as follows.

Age group	*No.*	*Mean length in inches*
+	3	13.4
1+	142	16.3
2+	6	18.1
3+	1	17.5

Oldest and longest fish. Nine fish in their seventh year were the oldest fish examined in this material. One of these, a fish whose life history may be indicated 3.1 + .2SM +, had a length of 23.5 inches, which was the highest length recorded from the sea trout examined. On the basis of a condition coefficient of 1 on the Scottish standard (cf. Nall, 1930, *op. cit.* p. 315) the fish would have weighed just under 6 lb. (5.97 lb.).

Calculated lengths. The length at the end of every year of life was calculated in the normal way, i.e. on the assumption that the growth of the scale was strictly in proportion to the growth of the fish, for every maiden fish of which the scales were suitable for measurements.

River Life. The mean length in inches in the different smolt classes at the end of each year of freshwater life have been given in Table 23. As in the case of the salmon the fastest growing parr migrated first. (see also Fig. 4). The mean smolt length increased as the smolt classes were ascended (Fig. 4). The mean smolt length at 7.5 inches is considerably lower than that of the Waterville River which has been estimated to be 9.9 inches (see Went, 1944 *Sci. Proc. R. Dublin Soc.* 23 (N.S.) No. 20 page 202). Type A smolts in general grow somewhat faster than type B smolts of the same smolt class.

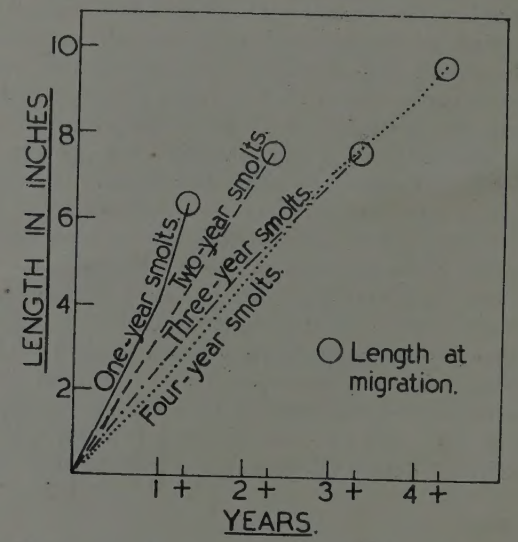

Fig. 4. Growth in fresh water of Inny sea trout.

Sea Life. Mean lengths at the end of each year in the sea in the different age groups have been given in Tables 23 and 24. As only the fish in their second post-migration year were in sufficient numbers, no conclusions can be drawn from the different mean lengths. The results are included, however, for comparison with the results from other rivers.

COMPARISON OF THE GROWTH OF SALMON AND SEA TROUT IN THE RIVER INNY.

In Tables 12 and 23 growth in the various categories of salmon and sea trout have been indicated. A complete comparison of the growth in the two species is not possible, but comparable groups can be compared, i.e. 2.1+ and 2.2+ groups in both species, (see Fig. 5). In every case the sea trout growth in fresh water was superior to that of the salmon, but at the end of the first year of sea life and at capture the salmon were superior in length to the sea trout. Similar conditions have been found in other rivers (see Went, 1941. *Proc. Roy. Irish Acad.* 47. B. No. 6. p. 174 and Went and Barker, 1943. " *Sci. Proc. R. Dublin Soc.* 23 (*N.S.*) No. 9. p. 97).

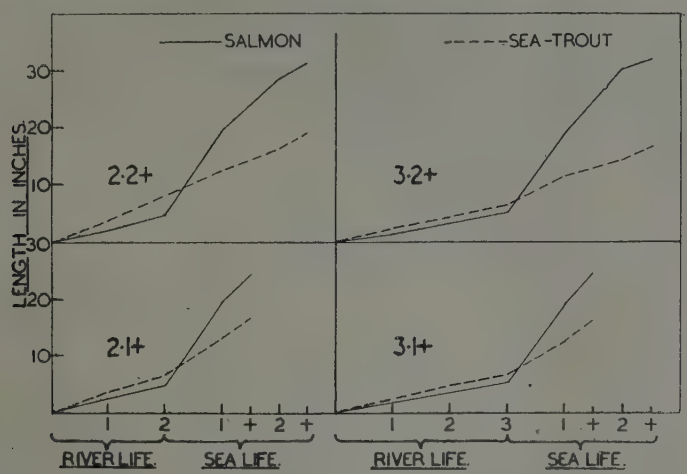

Fig. 5. Comparison of growth in salmon and sea trout in certain categories. (See above).

SUMMARY.

1. Material consisting of 747 sets of scales of salmon and 217 sets of scales of sea trout was collected during the years 1941-'44 from the River Inny (Fig. 1).

2. *Salmon.* Two-year smolts accounted for 80.6% of the total and three-year smolts for 16.3% (Table 3). The bulk of the fish were derived from type B smolts

(Table 4). The grilse formed 85.7 %of the total catch (Table 5) and the proportions of previous spawners (3.1%) and spring fish (4.2%) were small (Tables 5 and 7). A previous spawner which had spawned three times previously was noted (Plate 18). From the table showing divided migration and return (Table 8) it was shown that two-year classes contributed to over 96% of the stock. About 3/4 of the fish had lengths between 21.95 and 26.95 inches (Table 9 and Fig. 2). Average, maximum and minimum lengths of the various age groups were given in Tables 10 and 12. The proportion of fish having eroded scales and the mean degree of erosion increased as the season progressed. For the end of every year of life the lengths of each maiden or unspawned fish were calculated and the results are given (Table 11–12, 14–15). The fastest growing parr migrated first. (Fig 3.) Grilse were, on the average, longer at the end of the first year in the sea than any other age group (Table 11).

3. *Sea trout.* Two-year smolts formed over 3/4 of the total (Table 16) two smolt types being observed (Table 17). The fish were divided into the appropriate age groups (Tables 18 and 19). The question of divided migration and return (Table 20) was discussed. The average sizes of the different categories were given in Table 21. The oldest fish were in their seventh year. As in the salmon the growth of each maiden fish was calculated, and the results are given in Tables 22–24. Growth in fresh water was illustrated graphically (Fig. 4) when it was shown that the fastest growing parr migrated first.

4. A comparison of the growth in certain selected age categories of salmon and sea trout was made. (Fig. 5).

APPENDIX

Tables 3 to 15 relate to salmon and Tables 16 to 24 relate to sea trout.

Table 1. Chemical analysis of waters of the River Inny (results expressed as parts per 100,000).

Dissolved solids	(Volatile	1.6	Nitrates	0.066	
	(Fixed	5.2	Chlorine	2.1	
Saline Ammonia		0.0015	Silica ($Si.O_2$)	0.8	
Albuminoid "		0.019	Phosphorus (P_2O_5)	Nil	
Nitrites		0.01	Iron (Fe_2O_3)	less than 0.01	
Calcium Oxide (CaO)				0.7	
Magnesia (MgO)				0.1	
Sodium (Na_2O)				2.12	
Potassium (K_2O)				trace	

Table 2. Monthly samples of sets of scales.

Month	Salmon		Sea Trout	
	No.	%	No.	%
April	3	0.4	56	26.0
May	41	5.5	97	45.9
June	102	13.7	29	13.7
July	510	68.3	23	10.9
August	63	8.4	2	1.0
Sept.	28	3.7	4	1.9
Total	747	100.0	211*	100.0

* No data for the capture of six fish.

Table 3. Distribution of the different smolt classes in the various age groups

Smolt Age	Age group (in winters)				Total for Maiden fish only
	1+	2	2+	With SMs.	
1	1.5	6.2	5.8	4.4	2.1
2	80.1	84.4	86.5	91.2	80.6
3	17.3	9.4	7.7	4.4	16.3
4	1.1	-	-	-	1.0
Total	100.0	100.0	100.0	100.0	100.0

Table 4. Distribution of the different smolt types in the various smolt classes.

Smolt Age	Smolt type				Total	
	A		B			
	No.	%	No.	%	No.	%
1	-	-	15	2.1	15	2.1
2	56	7.7	528	72.9	584	80.6
3	35	4.8	83	11.5	118	16.3
4	4	0.6	3	0.4	7	1.0
Total	95	13.1	629	86.9	724	100.0

Table 5. Percentage of each age group in the catch of each month.

Month	Age group (in winters)				Total
	1+	2	2+	With SMs.	
April	-	100.0	-	-	100.0
May	7.3	39.1	53.6	-	100.0
June	72.5	10.8	15.7	1.0	100.0
July	94.3	0.2	2.0	3.5	100.0
August	90.4	-	4.8	4.8	100.0
Sept.	89.2	3.6	3.6	3.6	100.0
Total	85.7	4.2	7.0	3.1	100.0

Table 6. Percentage of the total catch of each age group in each month.

Month	Age group				Total
	1+	2	2+	With S.Ms.	
April	-	9.4	-	-	0.4
May	0.5	50.0	42.3	-	5.5
June	11.6	34.4	30.8	4.0	13.7
July	75.1	3.1	19.2	78.0	68.3
August	8.9	-	5.8	14.0	8.4
Sept.	3.9	3.1*	1.9	4.0	3.7
Total	100.0	100.0	100.0	100.0	100.0

*A "dropper"

Table 7. Percentage of spring and summer fish in each month of the season.

	April	May	June	July	Aug.	Sept.	Total
Spring Fish	100.0	39.1	10.8	0.2	-	3.6*	4.2
Summer Fish	-	60.9	89.2	99.8	100.0	96.4	95.8

* One fish only a "dropper".

Table 8. Showing divided migration and return as percentages of the total catch for one year.

Returned in 1941 as	Hatched in the year					Total
	1935	1936	1937	1938	1939	
Grilse (1+ winters)	-	0.9	14.9	68.6	1.3	85.7
Small spring fish (2 winters)	-	0.4	3.5	0.3	-	4.2
Small summer fish (2+ winters)	-	0.5	6.1	0.4	-	7.0
Previous spawners (With S.Ms.)	0.1	0.3	2.6	0.1	-	3.1
Total	0.1	2.1	27.1	69.4	1.3	100.0

Table 9. The estimated size distribution of salmon as percentages of the year's catch.

Class Interval*	Age group (in winters)				Total
	1+	2	2+	With S.Ms.	
18	0.1	-	-	-	0.1
19	0.4	-	-	-	0.4
20	2.7	-	-	-	2.7
21	4.6	-	-	-	4.6
22	8.6	-	-	-	8.6
23	13.0	-	-	-	13.0
24	20.1	-	-	0.1	20.2
25	18.0	-	-	-	18.0
26	12.2	0.3	-	0.5	13.0
27	4.4	-	0.1	0.2	4.7
28	0.9	0.5	0.3	0.5	2.2
29	0.4	0.5	0.8	0.8	2.5
30	0.3	1.7	1.5	0.2	3.7
31	-	0.7	1.6	0.4	2.7
32	-	0.3	1.1	0.2	1.6
33	-	0.1	1.1	-	1.2
34	-	-	0.4	0.1	0.5
35	-	0.1	-	0.1	0.2
38	-	-	0.1	-	0.1
Total	85.7	4.2	7.0	3.1	100.0

* 18 etc. includes all fish between 17.95 inches and 18.95 inches etc.

Table 10. Average length in inches of the grilse in each month of the season.

Month	No.	Mean Length	Estimated weight *
May	3	24.3	5.7
June	63	23.2	5.0
July	508	24.7	6.0
August	41	25.0	6.2
September	25	26.3	7.3
Total	640	24.5	5.9

* On basis of K = 1.1 (see text)

APPENDIX—*continued.*

Table 12. Calculated lengths in inches for the end of every year of life in the different categories* in maiden fish only.

Category	River Life Lengths at end of				Smolt Length	Sea Life Length at end of		Length at Capture
	1st year	2nd year	3rd year	4th year		1st year	2nd year	
1.1+	3.3	-	-	-	5.0	19.7	-	24.8
2.1+	2.3	4.8	-	-	5.6	19.5	-	24.5
3.1+	1.9	3.7	5.4	-	5.7	19.4	-	24.7
4.1+	1.5	3.3	4.8	6.1	6.4	20.1	-	25.3
1.2	3.0	-	-	-	5.2	20.0	30.1	30.1
2.2	2.2	4.6	-	-	5.3	19.2	30.2	30.2
3.2	1.8	3.7	5.7	-	6.2	20.3	31.8	31.8
1.2+	3.0	-	-	-	4.7	18.5	29.8	31.9
2.2+	2.2	4.7	-	-	5.4	19.0	28.9	31.4
3.2+	1.4	3.4	5.2	-	5.8	19.2	30.1	32.2

* The symbol 1.1+ etc. indicates that a fish had spent one winter feeding in fresh water as a parr and 1+ winters feeding in the sea.

Table 11. Calculated lengths in inches in the sea for the various age groups.

Age Groups in winters	Smolt size	Sea Life Length at end of		Length at capture
		1st year	2nd year	
1+	5.6	19.5	-	24.5
2	5.4	19.4	32.4	32.4
2+	5.4	19.0	29.1	31.5
Total	5.6	19.5	30.3	-

Table 13. Monthly proportion of fish having eroded scales and average degree of erosion.

Month	Age groups (in winters)			Total
	1+	2	2+	
Proportion of fish having eroded scales				
April	-	0	-	0
May	0	12.5%	4.5%	7.3%
June	0	18.2%	18.8%	2.0%
July	1.0%	100.0%	10.0%	1.4%
August	33.3%	-	33.3%	31.8%
September	20.0%	100.0%	0	21.4%
Total	4.5%	18.8%	8.7%	5.5%
Degree of erosion (on Menzies scale)				
April	-	0	-	0
May	0	0.5	0.1	0.2
June	0	0.5	0.3	0.1
July	0.03	3.0	0.2	0.3
August	0.7	-	0.3	0.7
September	0.5	3.0	0	0.6
Total	0.1	0.5	0.2	0.13

Table 14. Growth in fresh water (in inches)

Smolt Age	Mean length at end of				Mean smolt length
	1st winter	2nd winter	3rd winter	4th winter	
1	3.2	-	-	-	4.9
2	2.4	4.9	-	-	5.6
3	1.8	3.7	5.4	-	5.7
4	1.5	3.3	4.8	6.1	6.4

Table 16. Distribution of the various smolt classes in the various age groups (previous spawners included).

Post migration year	Smolt age (in winters)				Total	
	1	2	3	4	No.	%
1st	-	9	5	2	16	7.4
2nd	12	152	25	4	193	89.0
3rd	1	5	1	-	7	3.1
4th	-	1	-	-	1	0.5
Total	13	167	31	6	217	100.0
%	6.0	76.9	14.3	2.8	100.0	-

Table 17. Distribution of the two smolt types in the different smolt classes (maiden and previous spawners included).

Smolt class	Type A	Type B
1	-	100.0%
2	9.5%	90.5%
3	32.3%	67.7%
4	33.3%	66.7%
Total	12.9%	87.1%

Table 18. Distribution of the various age groups.

Post migration year	Maiden Fish		Previous Spawners *		All Fish	
	No.	%	No.	%	No.	%
+	3	2.0	13	20.3	16	7.4
1+	143	93.5	50	78.1	193	89.0
2+	6	3.9	1	1.6	7	3.1
3+	1	0.6	-	-	1	0.5
Total	153	100.0	64	100.0	217	100.0

* Age at first spawning only considered.

Table 19. Monthly distribution of different age groups.

Age	April	May	June	July	Aug.	Sept.	Total
	-	-	-	-	-	2	2
1	34	66	22	14	2	2	140
2	1	2	1	2	-	-	6
3	-	1	-	-	-	-	1
With S.Ms.	21	28	6	7	-	-	62
Total	56	97	29	23	2	4	211 *
%	26.6	45.9	13.7	10.9	1.0	1.9	100.0
% Previous Spawners	37.6	28.9	20.7	30.4	0	0	29.4

Table 15. Growth in the different smolt types in each smolt class.

Smolt Age	Type A						Type B					
	No.	Mean length at end of				Mean Smolt Length	No.	Mean length at end of				Mean Smolt Length
		1st winter	2nd winter	3rd winter	4th winter			1st winter	2nd winter	3rd winter	4th winter	
1	-	-	-	-	-	-	15	3.2	-	-	-	4.9
2	56	2.3	5.3	-	-	5.3	528	2.3	4.8	-	-	5.6
3	35	1.8	3.8	5.8	-	5.8	83	1.8	3.6	5.2	-	5.6
4	4	1.5	3.3	4.9	6.4	6.4	3	1.6	3.3	4.8	5.9	6.5

APPENDIX—*continued.*

Table 20. Divided migration and return showing the years in which the fish were hatched.

Returned in 1944 as fish in their	Hatched in					Total
	1938	1939	1940	1941	1942	
1st Post-migration year	-	-	-	1	2	3
2nd ditto.	-	3	19	112	9	143
3rd ditto.	-	1	4	1	-	6
4th ditto.	-	1	-	-	-	1
Previous spawners	9	18	31	6	-	64
Total	9	23	54	120	11	217

Table 21. Mean lengths in inches in the different age categories.

Age Category	No.	Mean length in ins.	Age Category	No.	Mean length in ins.
2.+S.M.+	4	15.7	2.1+2 S.M.+	12	20.5
2.+2 S.M.+	4	18.5	2.1+3 S.M.+	5	21.2
2.+3 S.M.+	1	18.3			
			3.1+	19	16.5
3.+	2	12.8	3.1+S.M.+	3	17.8
3.+S.M.+	3	15.7	3.1+2 S.M.+	3	20.2
4.+	1	14.5	4.1+	3	16.9
4.+S.M.+	1	16.9	4.1+S.M.+	1	17.0
1.1+	9	15.5	1.2+	1	15.9
1.1+S.M.+	2	17.2			
1.1+2 S.M.+	1	20.1	2.2+	4	19.0
			2.2+S.M.+	1	20.3
2.1+	111*	16.4			
2.1+S.M.+	23	17.6	3.2+	1	16.6
			2.3+	1	17.5

* One not measured.

Table 22. Growth (in inches) in fresh water in the different smolt classes.

Smolt Age	No.	Length at end of				Mean Smolt Length
		1st year	2nd year	3rd year	4th year	
1	10	4.2	-	-	-	6.4
2	113	3.3	6.6	-	-	7.5
3	22	2.5	4.9	6.9	-	7.6
4	4	2.1	4.6	7.1	8.9	9.6

Table 23. Estimated growth in inches in the various age categories.

Age Category	No.	Years in River				Mean Smolt Length	Years in Sea		Mean Length at Capture
		1	2	3	4		1	2	
3.+	2	2.5	5.2	8.6	-	9.8	-	-	12.8
4.+	1	2.2	5.7	7.9	10.8	11.8	-	-	14.5
1.1+	9	4.2	-	-	-	6.5	11.9	-	15.5
2.1+	109*	3.4	6.5	-	-	7.5	12.6	-	16.4
3.1+	19	2.5	4.9	6.8	-	7.4	12.3	-	16.5
4.1+	3	2.1	4.4	6.8	8.3	8.8	13.4	-	16.9
1.2	1	4.0	-	-	-	5.8	9.3	12.7	15.9
2.2	4	3.8	8.1	-	-	8.8	12.5	16.1	19.0
3.2	1	2.3	4.4	6.7	-	8.0	11.6	14.3	16.6

* Three fish not measured.

Table 24. Estimated growth in inches in various age groups.

Age group.	No.	Mean smolt length	Years in Sea		Mean length at capture
			1	2	
+	3	10.5*	-	-	13.4*
1+	140	7.4	12.5	-	16.3
2+	6	8.2	11.8	15.2	18.1

* Only older smolt classes included (See text).

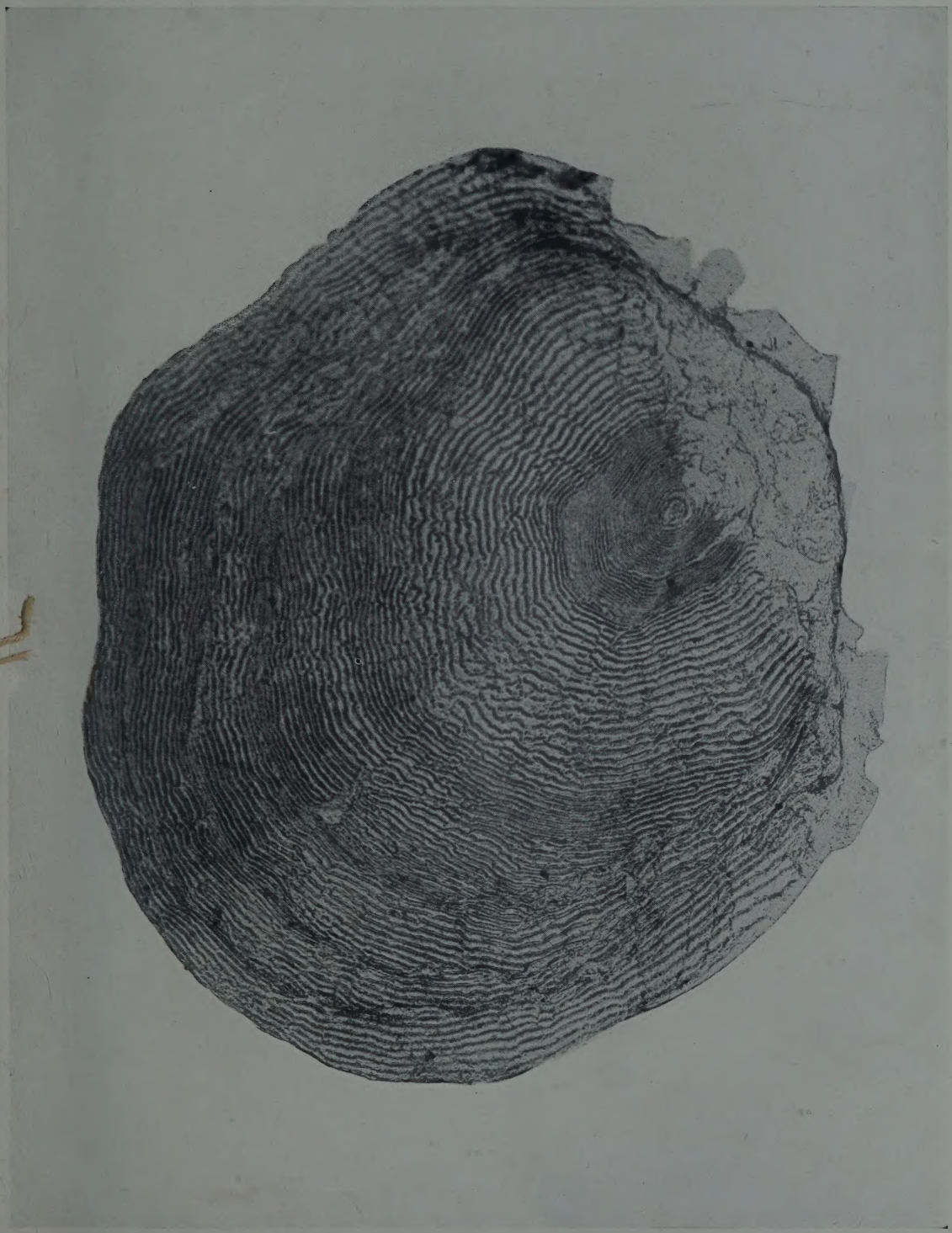

PLATE.—Photograph of a scale of a salmon (35 inches long) which had spawned on three previous occasions captured on 19th July, 1941. Magnification x 25.